

ERIC Document Resume		See Instruction Sheet		DATE OF RESUME 7/12/65		DATE RECEIVED	
A. PUBLICATION DATA							
1. ERIC NUMBER ED0000309		2. ORIGINATOR CONTROL NO(S). 7041		3. IDENTIFICATION NO. N.A.		DO NOT WRITE IN SPACE BELOW	
4. AUTHOR(S): Hoyer, Horst W.						MICROFILM COPY AVAILABLE YES ☒ NO ☐	
5. TITLE OF DOCUMENT ABSTRACTED: The Hunter College Woman Chemistry Graduate, 1940 to 1955						COPYRIGHT GRANTED YES ☐ NO ☒	
6. PUBLICATION TITLE: N.A.						COPYRIGHT RELEASE FILED YES ☐ NO ☐	
7. EDITOR(S): N.A.				8. PLACE OF ORIGIN ORG. Hunter College ST. New York, N.Y. CITY, STATE TELE. EXT. INST/LOC CODE		TYPE OF REPORT PROPOSAL ☐ IN-PROGRESS ☐ FINAL ☒ FOLLOW-UP ☐	
9. PUBLISHER OR SOURCE Hunter College						OTHER ERIC REFERENCES:	
10. VOL. N.A.	11. PAGES N.A.	12. MO./YR. 58	13. TOTAL PP. 20			ERIC SATELLITE CODE	
B. INDEXING DATA							
14. SUBJECT AREA				15. TYPE OF ENDEAVOR survey			
16. INDEXING TERMS (6-12)							
surveys Y-18A		careers R-41					
graduates S-05		sex factors Y-06					
chemistry R-44		science Y-04					
17. ABSTRACT (MAX. 250 WORDS)							
Study to evaluate the role of women in chemistry and contributions made to this field by chemistry majors of Hunter College. Reports results of questionnaires sent to chemistry majors graduating during the period 1940 to 1955.							
ERIC No. 18. SOURCE OF ABSTRACT							
C. FUNDING DATA							
19. SUPPORTING ORGANIZATION				20. DIVISION OR DEPT.		21. CONTRACT NO.	
				22. TOTAL COST OF PROJECT		PROJECT NO.	
				23. DURATION OR PROJECT		U.S. Department of Health, Education, and Welfare Office of Education	

IV-3

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education

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THE HUNTER COLLEGE WOMAN CHEMISTRY GRADUATE,

1940 to 1955

by

Horst W. Hoyer

March, 1958

ED000309

ACKNOWLEDGMENT

The author gratefully acknowledges the help of the members of the Hunter College Chapter of the Student Affiliates of the American Chemical Society in much of the clerical work and of the Office of Institutional Research of Hunter College for helpful criticism in the compilation of the data.

I. AIMS AND PROCEDURES

In order to evaluate the role of women in chemistry and specifically the contribution of chemistry majors of one women's college, Hunter College of the City of New York, to the field of chemistry, the post-graduate activity of a group of its chemistry majors graduating during the period 1940 to 1955 was studied. The aim was to learn where Hunter students had worked, the kind of work performed, how long they remained at work and, in general, what use they had made of their major.

In order to accomplish these aims a questionnaire was sent out in the spring of 1957 to the 734 women who had majored in chemistry during the period 1940 to 1955 whose addresses were in the college files. This interval made it possible to study the professional activity of these women in teaching and in industrial and related fields up to and after marriage. Because of the length of time since graduation the mailing addresses in the college files were often inaccurate, and 234 questionnaires were undelivered.

One month after the initial mailing a postcard reminder was sent out to all alumnae who had not yet returned the questionnaire. Out of the 507 questionnaires which presumably were received, 264 replies (52%) were returned. This corresponds to approximately 36% of all the chemistry majors who were graduated during 1940 to 1955.

Information concerning the number of questionnaires mailed, presumed delivered and returned is tabulated in Table 1. The years for which incomplete information existed are also indicated in Table 1.

Table 1
 Number of Questionnaires Mailed to, Delivered and Returned by
 Hunter College Women Graduates Who Majored in Chemistry, 1940-1955

Year of Graduation	Number Mailed	Number Presumed Delivered	Number Returned	% Returns presumed delivered
1940	48	24	6	25
1941	60	22	14	64
1942	56	25	11	44
1943	44	35	19	54
1944	58	38	22	58
1945	67	48	15	31
1946*	50*	34	22	65
1947	98	72	31	43
1948*	2*	1	0	-
1949	43	34	15	44
1950*	41*	27	23	85
1951	58	47	23	49
1952	29	25	14	56
1953	24	21	14	67
1954	24	24	15	62
1955	32	30	20	67
Totals	734	507	264	52%

* Incomplete information

II. GRADUATE STUDY

Slightly more than half, 52%, of the women chemistry majors who replied to the questionnaire obtained some sort of graduate training. The 138 students who went on to graduate school attended 41 schools and universities throughout the United States. Graduate schools in New York City attracted 96 of these students. Table 2 lists the number of students attending schools attracting three or more Hunter chemistry graduates.

Table 2
Graduate Schools Attended by
Hunter College Chemistry Graduates 1940-1955

School	Number of Graduates Attending	% of Graduates Attending (n = 264)
Columbia University	26	9.8
Hunter College	23	8.7
New York University	23	8.7
Brooklyn Polytechnic	15	5.7
Brooklyn College	6	2.3
New School for Social Research	3	1.1
Total New York City (6 schools)	96	36.3
Total Outside New York City (35 schools)	42	15.9
Total Attending Graduate Schools	138	52.2%

While a large number of the chemistry alumnae continued their formal education after graduation from Hunter, not all of the 138 students actually received an advanced degree. Of this number 32 are students now in graduate school and 87 have either received an advanced degree or expect to receive one in the near future. The latter group of alumnae with, or about to receive, advanced degrees are tabulated in Table 3.

Table 3
Graduate Degrees of Hunter College
Chemistry Majors 1940-1955

Degree	Number	Per Cent (n = 264)
M. A.	28	11
M. S.	26	10
M. D.	19	7
Ph. D.	8	3
Other	6	2
Total	87	33

The subjects studied by these 138 students in graduate schools are shown in Table 4. A considerable number, 28 of the 138, continued their study in the field of education. This might be expected, since New York State requires a masters degree of its high school teachers. Table 5 gives similar information for the alumnae actually receiving an advanced degree.

Table 4
Subjects Studied in Graduate Schools by
Hunter College Chemistry Majors 1940-1955

Subject	Number	Per Cent
Chemistry	80	58
Education	28	20
Medicine	20	15
Other Fields	10	7
Total	138	100

Table 5
Subjects Studied in Graduate Schools by
Hunter College Chemistry Majors Receiving Advanced Degrees

Degree Received	Number of Alumnae for Different Subjects Studied			
	Chemistry	Education	Medicine	Others
M. A.	13	12	0	3
M. S.	22	0	0	4
Ph. D.	8	0	0	0
M. D.	0	0	19	0

Data for the different fields of chemistry studied by those alumnae who continued their training in chemistry is given in Table 6.

Table 6

Chemistry Fields Studied by Hunter College
Chemistry Alumnae, 1940-1955, in Graduate School

Fields	Number	Per Cent
Organic Chemistry	33	41
Biochemistry	22	28
Physical Chemistry	10	12
Inorganic Chemistry	9	11
Analytical Chemistry	6	8
Total	80	100

The questionnaires revealed a considerable amount of scientific research, indicated by number of publications among the alumnae. No attempt was made to evaluate quality of publications. However, 59 persons, corresponding to 22% of all the replies, reported a total of 152 publications in recognized technical or scientific journals. In addition, two books have been published by former chemistry majors, one in the field of education and one of a technical or scientific nature. Titles of books and of articles were not obtained.

In an attempt to discover the potentialities for a retraining program in scientific and educational subjects for these alumnae, the alumnae were asked if they would be interested in a graduate program in strictly scientific subjects and/or a program aimed specifically towards preparation for teaching. Approximately 7%, 18 alumnae, would enroll

in the near future in such programs if offered. No significant difference existed for the percentage of those interested in one program as compared to the other.

III. EMPLOYMENT DATA

Fifty-one per cent of the women who graduated as chemistry majors during the period studied are now employed. Of these, 60% are in a chemical field, 15% are in education and the remaining 25% in some other field such as medicine, nursing, or secretarial work. Distribution of employment according to year of graduation is shown in Table 7. As might be expected, a larger percentage of the more recent graduates is currently employed than is true of the group as a whole. Apparently a smaller percentage of the women who graduated ten to twelve years ago are now employed than is true of those graduating before or after this period.

Table 7

Year of Graduation of Hunter College
Chemistry Majors Currently Employed

Year of Graduation	Questionnaires Returned	Number Alumnae Now Employed	% Employed
1940-1944	72	36	50
1945-1950*	106	44	41.5
1951-1955	86	54	62.8

*Excluding 1948, for which data is incomplete

The earnings of this group at the time of the questionnaire are given in the graph of Figure 1. The median annual earnings are between \$4,500 and \$5,499. However, 63.5% earned more than \$4,500 per year. Similar data for those employed alumnae who received an advanced degree or who expect to receive such a degree in the near future are tabulated in Table 8. The few reports of income less than \$2,500 may represent income from graduate assistantships and fellowships of those alumnae now completing their graduate studies. Four of the alumnae with M. D. degrees also reported annual earnings of less than \$2,500. In this case the figures may reflect income received during internship.

The distribution of income for women with M. A. degrees is not too different from that of all the chemistry alumnae as shown in Figure 1. However, those with M. S. degrees earn approximately \$1000 more per year than the group as a whole. The highest annual earnings are reported by those with an M. D. degree. Neglecting the four returns citing income of less than \$2,500 per year, which may represent alumnae still receiving medical training, the average earnings of this group are between \$7,500 and \$8,499.

The questionnaire revealed interesting information concerning the positions held by the respondents. Figure 2 gives the number of positions held: the abscissa gives the maximum number of positions held, while the per cent of respondents holding positions is given by the ordinate. While 32% have held only one position, the median graduate has held two. A small fraction, 3.8%, never held any position after graduation.

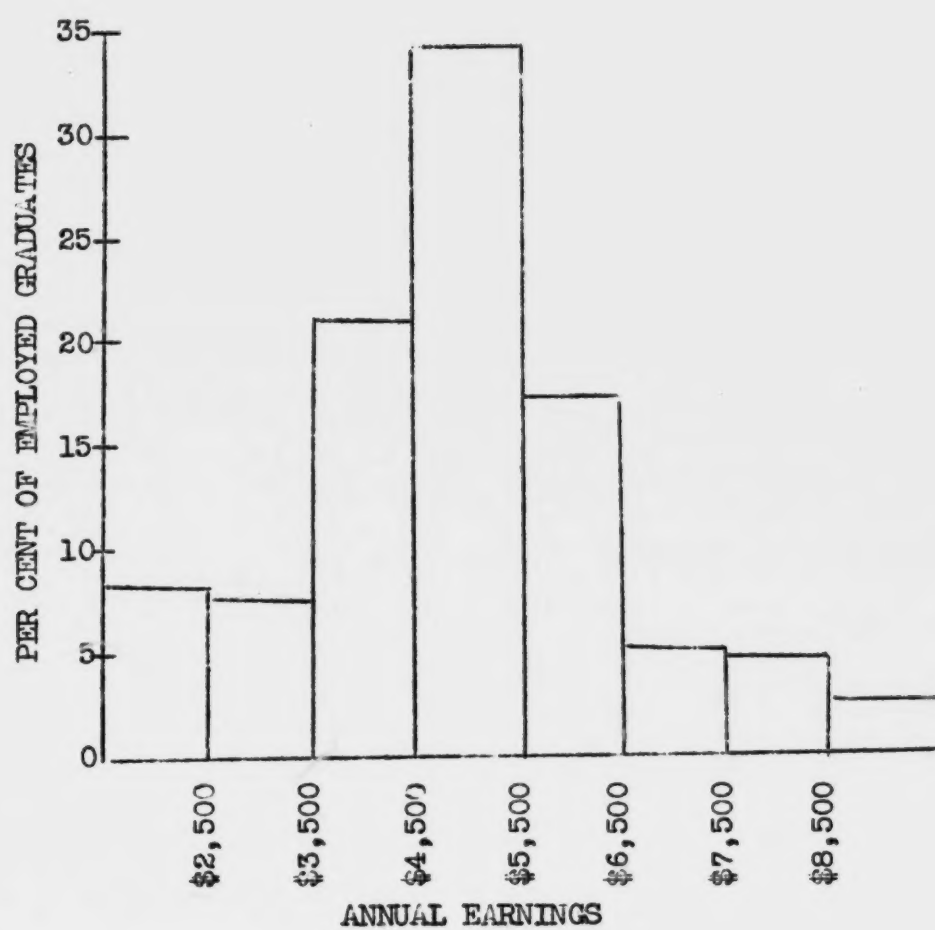


Figure 1. Current earnings of Hunter College women chemistry graduates, 1940-1955

Table 8

Annual Earnings of Employed Hunter College Chemistry Alumnae,
1940-1955, With, or About to Receive an Advanced Degree

Degree	Annual Earnings							
	less than	\$2,500 to	\$3,500 to	\$4,500 to	\$5,500 to	\$6,500 to	\$7,500 to	more than
	\$2,500	\$3,499	\$4,499	\$5,499	\$6,499	\$7,499	\$8,499	\$8,500
M. A.	2	2	4	8	1	0	0	0
M. S.	0	0	2	5	6	2	0	0
Ph. D.	2	0	1	0	1	0	1	0
M. D.	4	0	0	0	0	2	3	1

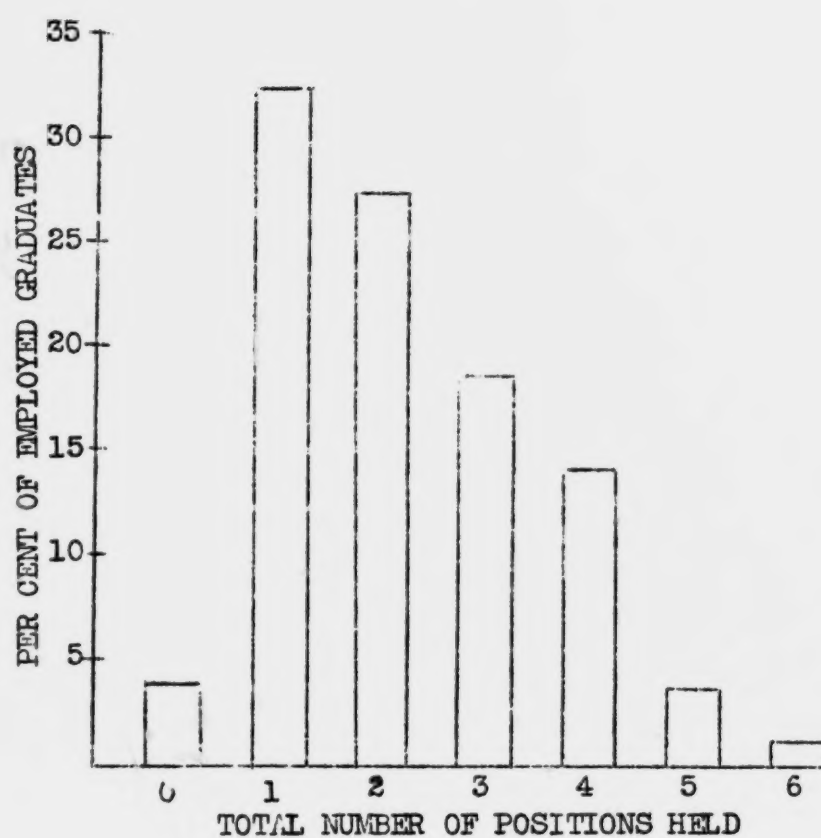


Figure 2. Number of positions held by Hunter College women chemistry graduates, 1940-1955

The per cent of respondents employed in different fields and the changes in the type of employment are indicated in Figure 3. The responding alumnae classified their positions into the eight types indicated on the graph. Results are shown for the first three positions held. There is a marked tendency to leave the more routine type of work associated with the analytical chemist or the laboratory technician. At the same time there is a marked increase in the percentage of graduates involved in non-chemical work and in the percentage of those involved in fundamental scientific research.

Figure 4 shows the number of months spent in the first position. If the relative time spent in each type of work is taken as a measure of the satisfaction of the women with their work, then elementary school teaching proved more satisfying than work in chemistry. The median time spent in elementary school teaching was 41 months, in chemical library work 40 months and in industrial chemical work 30 months. However, since only four graduates reported elementary school teaching and four reported chemical library work as their first position some doubt may be felt as to the statistical validity of this conclusion.

An attempt was made to discover why these alumnae left the different fields of work. The results are tabulated in Table 9. On the extreme left are listed the different reasons given for leaving the position. The results have been analyzed according to the different types of positions which were already reported in Figures 3 and 4. Only those chemical fields in which 25 or more graduates were employed in their

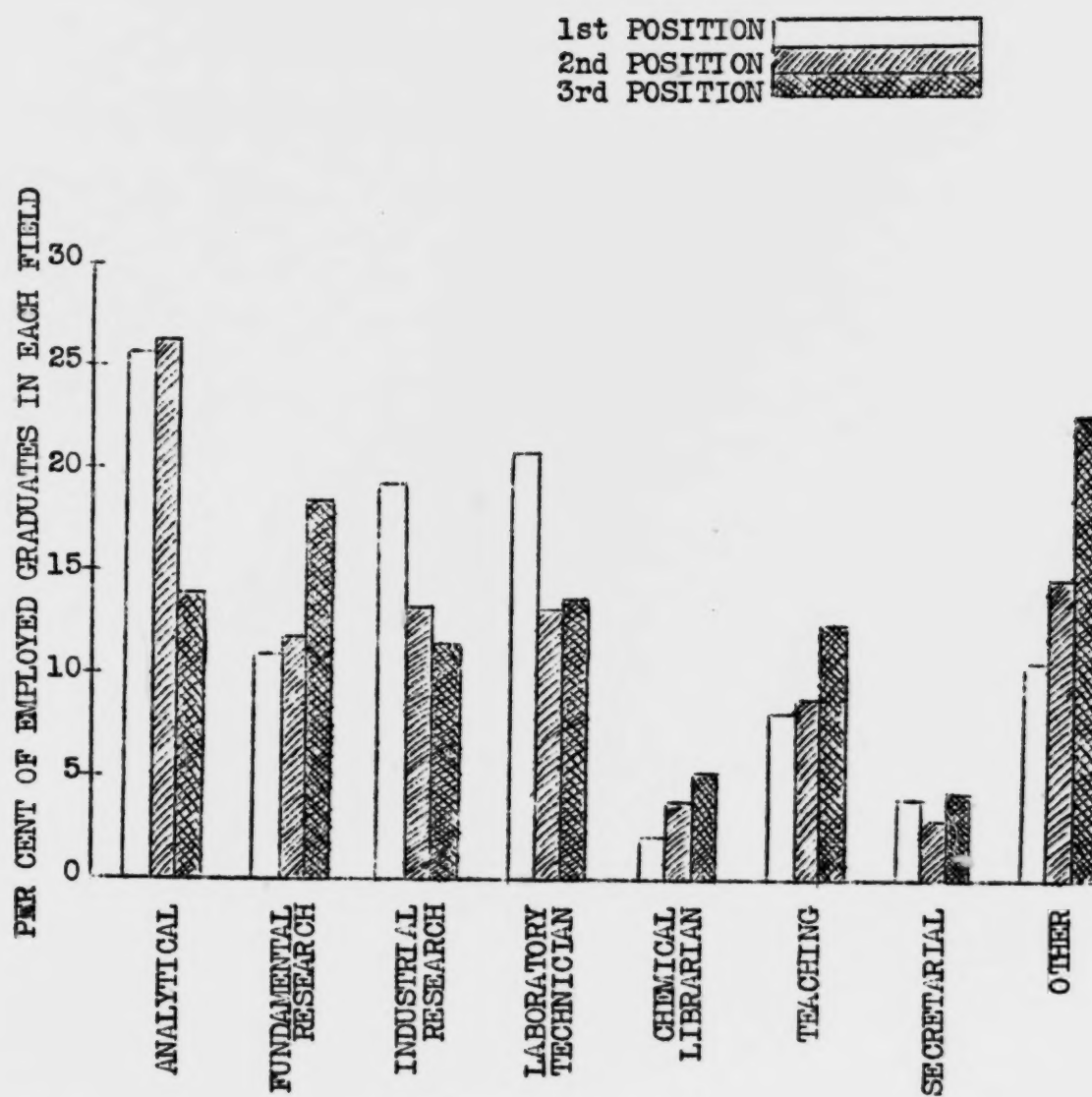


Figure 3. Fields of employment of Hunter College chemistry alumnae, 1940-1955

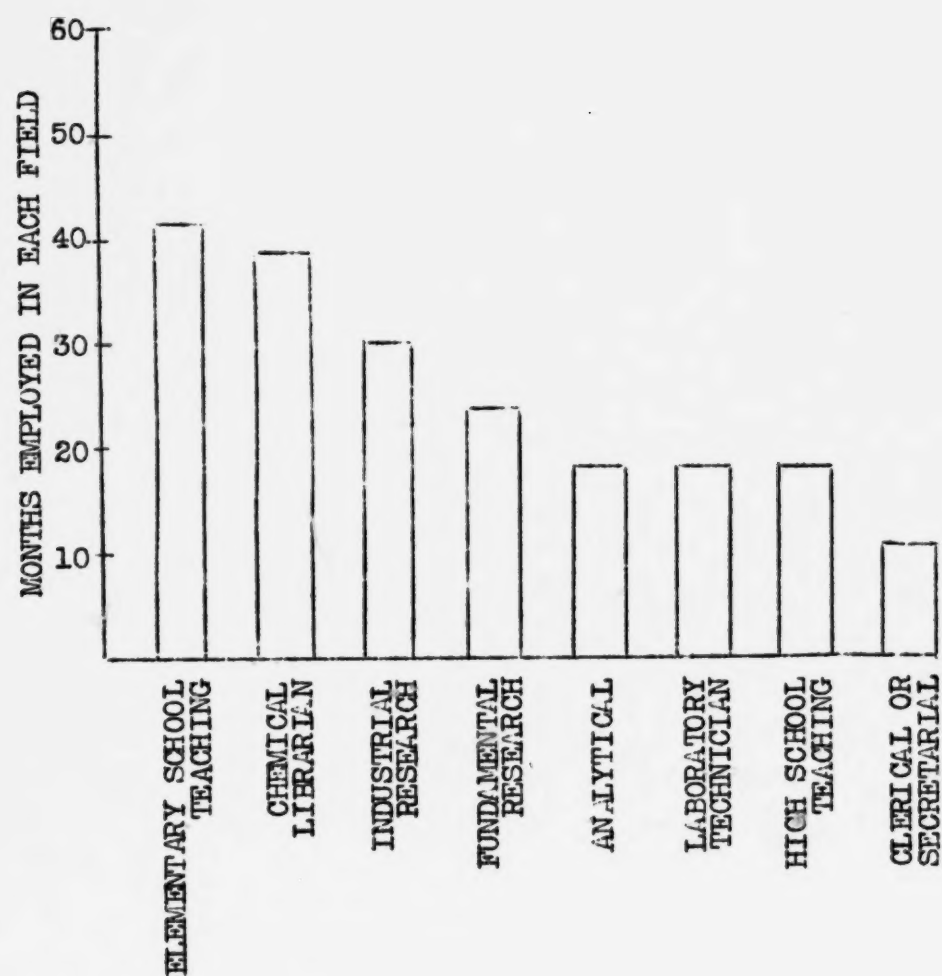


Figure 4. Months of employment of Hunter College Chemistry alumnae, 1940-1955, in different fields (median values for first position)

first position are included in this table. However, the 10 graduates who reported elementary or high school teaching as their first position are also included. The numbers within the columns represent the number and the percentage of alumnae in each field giving the indicated reason for leaving the first position.

It is quite apparent that the different fields give rise to quite different dissatisfactions. The fact that approximately 20% of those who started in industrial and in fundamental research and 30% of those who started in the field of education are still working in these fields is a probable indication of the satisfaction derived from this type of work.

Separate analysis of the returns for those alumnae with M. S. and Ph. D. degrees in chemistry revealed only minor deviations from the values reported in Figures 2, 3, and 4. The different types of work for women with this special training is illustrated in Figure 5 for the first position held by members of this group. This figure may be compared with Figure 2 which gives similar information for the entire chemistry group.

In an attempt to evaluate the effectiveness of different methods and agencies of obtaining employment, the alumnae were asked to check methods which they found successful in securing positions. The results are tabulated in Table 10. The most successful involve the personal effort of the individual in making necessary contacts with prospective employers.

Table 9
Hunter College Chemistry Graduates 1940-1955:
Their Initial Employment and Their Reasons for Leaving by Area of Employment

Reason for leaving	Analytical Work		Fundamental Research		Industrial Research		Laboratory Technician		Elementary and High School Teaching	
	N	%	N	%	N	%	N	%	N	%
Poor Working Conditions	4	6	0	0	2	4	2	4	0	0
Inadequate Salary	9	14	4	15	6	12	21	40	1	10
Undesirable Location	1	2	2	8	1	2	1	2	1	10
Loss of Interest in Work	11	17	2	8	8	16	8	15	1	10
Marriage	8	13	1	4	1	2	1	2	1	10
Start of Family	11	17	4	15	10	20	6	12	3	30
Transfer of Husband to New Location	7	11	2	8	3	6	2	4	0	0
Other Than Above	11	17	6	23	9	18	8	15	0	0
Still Working	2	3	5	19	10	20	3	6	3	30
Total	64	100	26	100	50	100	52	100	10	100

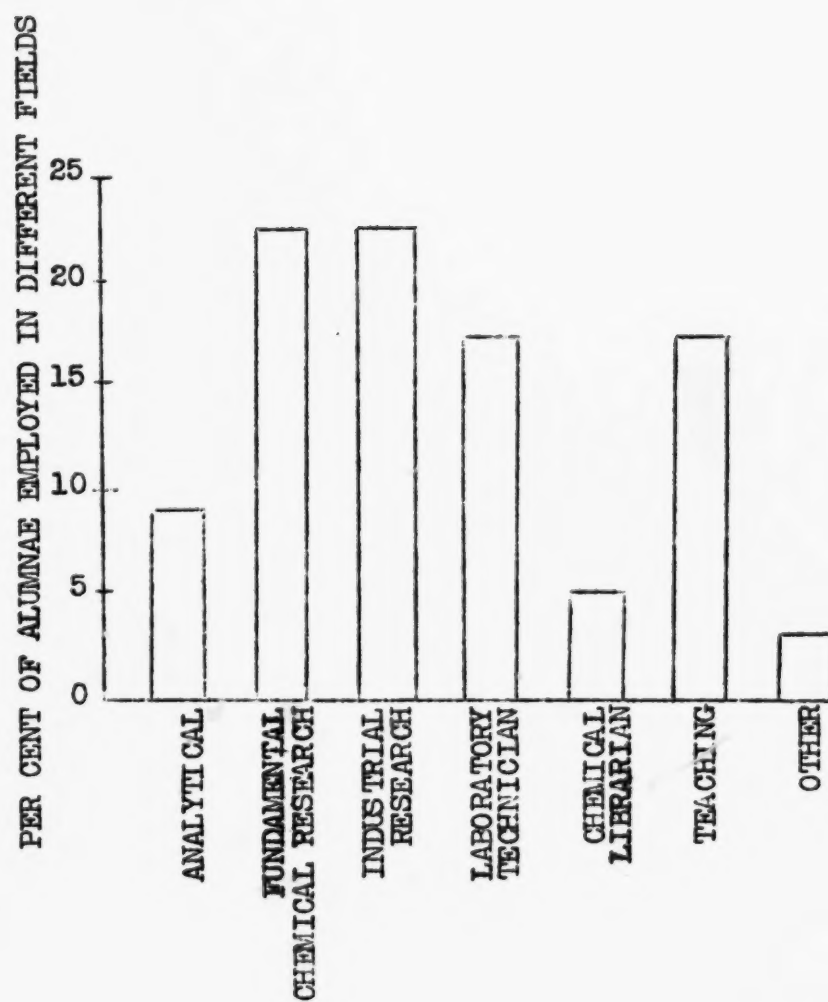


Figure 5. Fields of employment of Hunter College Alumnae, 1940-1955, with M. S. or Ph.D. degrees in Chemistry (first position held)

Table 10
Sources Used in Securing Employment by
Hunter College Chemistry Graduates, 1940-1955

<u>Sources used</u>	<u>Number Using</u>
Personal Contact	137
Newspaper Advertisements	79
Commercial Placement Agencies	69
Hunter College Placement Bureau	58
Advertisements in Chemical and Engineering News	19
Government Agencies and Civil Service Examination	19
American Chemical Society's Employment Clearing House	16

IV. MISCELLANEOUS INFORMATION

Advantage was taken of the opportunity to obtain some statistics of nontechnical, i.e. nonprofessional, nature. In the group studied, 74% were married women. While considerable variation existed in the time interval between graduation from college and marriage, the median married alumna was married 24 months after graduation, continued to work for two years after marriage and has two children. The influence of technical training--or perhaps nature of employment--upon the selection of a marriage partner is shown by the fact that 54% of these chemistry majors married men trained in technical or scientific fields. Tables

11 and 12 tabulate the number of years after graduation to marriage and the number of years these women worked after marriage.

Table 11

Marital Status of Hunter College

Chemistry Alumnae, 1940-1955

<u>Years after</u> <u>Graduation</u>	<u>Alumnae who married</u> <u>at indicated time</u>
Before graduation	12
1 year after	39
2 years after	41
3 years after	34
4 years after	21
5 years after	13
6 years after	10
7 years after	5
8 years after	4
9 or more years after	6

Table 12

Employment Status of Hunter College

Married Chemistry Alumnae, 1940-1955

<u>Years after</u> <u>marriage</u>	<u>Number Continuing</u> <u>work after</u> <u>marriage</u>
0	16
1	48
2	39
3	22
4	22
5	13
6	12
7	3
8	4
9 or more	9

V. SUMMARY

The post-graduate activities of 264 of the Hunter College chemistry majors graduating during the period 1940 to 1955 have been studied. Fifty-two per cent received graduate training in 41 higher institutions throughout the United States. Six New York City higher institutions attracted almost 70% of those attending graduate school. Approximately 33% of the chemistry alumnae answering the questionnaire received or expected to receive an advanced degree. The majority of these continued their education in chemistry. The group studied included authors or co-authors of 152 publications in technical and scientific journals and of two books.

Fifty-one per cent of these women are now employed, the majority in a chemical field. The median annual earnings are between \$4,500 and \$5,499. The alumnae with M. A. degrees had approximately the same salary distribution as the B. A. graduate, while those with M. S. degrees showed a median between \$5,500 and \$6,499 per year. Omitting four returns of income less than \$2,500 per year, which may represent earnings of internes, the alumnae with M. D. degrees report an average annual income between \$7,500 and \$8,499.

The "average," that is, median, chemistry alumna has held two positions, staying approximately two years in each. The time in each position varied, however, with the nature of her work. She married a man trained in a scientific field two years after graduation and continued to work for two years after marriage.